

ANAESTHETIC MANAGEMENT OF AN INFANT WITH BRONCHOGENIC CYST POSTED FOR THORACOTOMY

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ABSTRACT

Bronchogenic cyst is a benign congenital cystic lesion of lung, develops by irregular growth of ventral foregut and lung budding, mostly located in the middle of mediastinum. The cyst may be asymptomatic or a focus for recurrent respiratory infection or may lead to life threatening airway obstruction, which is a great challenge to an anaesthesiologist. Use of nitrous oxide and positive pressure ventilation is of theoretical concern. Post-operative analgesia in paediatric thoracotomy is also an important aspect of anaesthetic management that contributes to smooth recovery of the patient.

KEYWORDS

Bronchogenic cyst, Thoracotomy, post-operative analgesia.

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INTRODUCTION: Bronchogenic cysts were first described by Blackader and Evans in 1911 and first successful resection was performed by Maier in 1948. Mediastinal masses since then have posed a variety of challenges for anaesthetic management when these patients are posted for resection. We describe one such complication we had to face when an infant was posted for thoracotomy and our successful management which lead to uneventful recovery.

CASE REPORT: A 7-month-old female child presented with history of recurrent fever, cough, reduced oral intake, noisy breathing since 7 days. On examination, she was febrile and tachypneic with stridor, subcostal and intercostal chest retractions were present, maintaining oxygen saturation with nasal cannula. There was equal air entry on both sides with occasional rhonchi. CXR showed soft tissue opacity at right parahilar region suggestive of pneumonitis. A 2D echo was normal. CT thorax revealed a well-defined cystic lesion measuring 30x13x30mm in the posterior mediastinum causing compression of trachea, right main bronchus and oesophagus with differential diagnosis of bronchogenic cyst or oesophageal duplication cyst (Fig. 1). The latter was ruled out with barium swallow (Fig. 2). Haemoglobin was 8.7mg/dl. Arterial blood gas analysis revealed pO₂-122.7mmHg, pCO₂-45.8, pH-7.4, HCO₃-29.7 and SpO₂-98.8%.

The child was posted for right thoracotomy for excision of the bronchogenic cyst. Informed high risk consent was taken from the child's relatives and was kept fasting. Intraoperative monitoring included ECG, oxygen saturation and end tidal carbon dioxide. Intravenous lines were

secured. After pre-oxygenation, patient was induced with O₂-N₂O and sevoflurane to facilitate endotracheal intubation. Maintenance was with 50% O₂-N₂O, 2% sevoflurane and intermittent vecuronium 0.02mg/kg IV, was ventilated using low tidal volume and high respiratory rate. Attempts to cannulate radial artery were unsuccessful. An 18G Epidural catheter was inserted through an 18G hypodermic needle from caudal space and fixed with tip at T6 level; 0.125% bupivacaine and 5µg fentanyl (total 6ml) was given epidurally after test dose. The patient was positioned and right posterolateral thoracotomy was performed through the 4th intercostal space. The cyst was identified by the surgeons and cyst wall was adherent to the bronchus. On excision of the cyst, there was sudden desaturation and cyanosis and bradycardia (Fig 3). We were unable to ventilate the patient with 100% oxygen. Inj. Atropine 0.02mg/kg IV was given. An iatrogenic injury was noted in the right bronchus. Surgeons were informed to immediately repair the defect. Once the defect was repaired, saturation gradually increased up to 100% and hemodynamic parameters normalised. Surgeons confirmed no air leak. Blood products and IV fluids were replaced according to the loss. Rest of the course remained uneventful. An intercostal drain attached to under water seal was placed. At the end of the surgery, patient was reversed with Inj. Glycopyrrolate 0.008µg/kg IV and Inj. Neostigmine 0.05mg/kg IV. Patient was extubated after fulfilment of criteria. Post-operative arterial blood gas analysis values were pO₂-149.8, pCO₂-42.4, pH-7.33, HCO₃-28, SpO₂ - 99.2% on oxygen mask; 0.125% bupivacaine and 5µg fentanyl was given 8 hourly epidurally for post-operative analgesia.

DISCUSSION: Bronchogenic cyst is a rare cause of respiratory distress in children comprising of 7.5% of all mediastinal masses.^(1,2,3) Prevalence being 1:42,000 approximately.⁽⁴⁾ these benign cysts arise from the airway and often remain intimately attached, can lose their

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communication with airway during development. They are often solitary and may contain air, fluid or sometimes mucous glands, cartilage, and smooth muscle. They are lined with ciliated columnar epithelium or stratified squamous epithelium which are elements normally present in trachea and bronchi.^(1,5) Clinically, children present with respiratory distress which is aggravated by crying and feeding as a result of compression of adjacent mediastinal structures which can result in cardiorespiratory compromise.^(1,4,5,6) They are more likely to be a focus of infection resulting in purulent drainage. So it is absolute indication to excise the cyst, although they maybe asymptomatic. Rupture of cyst can cause pneumothorax.^(1,3)

A thorough pre-operative evaluation is crucial to plan for definitive intraoperative and postoperative management and we should have a backup plan in case of any untoward complications. In our case, the child presented with respiratory distress due to compression of trachea. The severity of patient's respiratory symptoms may not correlate with degree of respiratory compromise during anaesthesia. Respiratory distress can occur during induction or intubation or even during emergence after extubation. Awake intubation or inhalation induction is preferred.

Use of N₂O and positive pressure ventilation has been controversial, but there are reports of successful anaesthetic management with inhalational induction with N₂O. It has been argued that with use of N₂O oxide, there is expansion or rupture of the intrathoracic cyst due to differences in solubility between N₂O and nitrogen. Positive pressure ventilation has a ball-valve effect in cysts that extrinsically compress the tracheobronchial tree causing air trapping distal to the cyst resulting in hyperinflation of lung, mediastinal shift and decreased venous return causing hypotension.^(1,3,7,8) We proceeded with inhalational induction followed by positive pressure ventilation. Intraoperatively, muscle relaxant is used for better surgical manipulation.^(1,7) Manipulations in a smaller thorax of an infant can compress the tracheobronchial tree, lungs, heart or great vessels resulting in massive blood loss. So arterial line is essential to allow beat to beat monitoring of blood pressure, acid base status and measurement of serial hematocrits and accordingly intravenous fluids and blood transfusion can be made.^(1,7)

In our patient, there was sudden desaturation, cyanosis and bradycardia. We could immediately identify that we were unable to ventilate the patient due to breach in right main bronchus when the surgeons excised the cyst wall which lead to hypoxia and bradycardia. Inj. Atropine was given and surgeons immediately were asked to close the defect which they could do at the earliest. The patient was ventilated with 100% oxygen after which saturation increased and patient became hemodynamically stable. Other causes of bradycardia can be vagal stretching as right vagus nerve can be adherent to the cyst. But saturation and blood pressure would not fall in this situation.⁽¹⁾ Remaining events including extubation remained uneventful.

In patients undergoing thoracotomy, there is decrease in functional residual capacity post operatively. Ability to

cough and breathe deeply is decreased due to pain; patient may not be able to clear secretions leading to atelectasis and pneumonia. Hence, analgesia is an important aspect. Intramuscular injections are painful and associated with unpredictable uptake and distribution. Intercostal nerve blocks can be given by surgeons just before skin incision or under direct vision prior to skin closure, but requires very large doses in infants which may cause local anaesthetic toxicity. Paravertebral nerve blocks provide analgesia almost similar to intercostal blockade it includes complications of spinal, epidural and intravascular injections. Continuous analgesia can be provided using continuous intravenous infusion with or without patient controlled analgesia dosing.⁽⁹⁾ We have used the combination of bupivacaine and fentanyl epidurally; being a combination of local anaesthetic and low dose opioid, provides maximum pain relief with minimal chances of tachyphylaxis without compromising pulmonary function and reduced chances of local anaesthetic toxicity. Fentanyl being highly lipophilic provides safe analgesia epidurally than parenteral administration. It spreads minimally in epidural space and optimal postoperative analgesia is obtained.^(7,9,10)

CONCLUSION: Anaesthetic management of thoracotomy is different from other surgeries. Constant communication with surgeons results in better outcome of the patient. Epidural anaesthesia facilitates excellent intraoperative as well as post-operative analgesia with less cardiorespiratory compromise. If facilities are available, VATS and robotic resection have minimum complications and better post-operative recovery than thoracotomy.

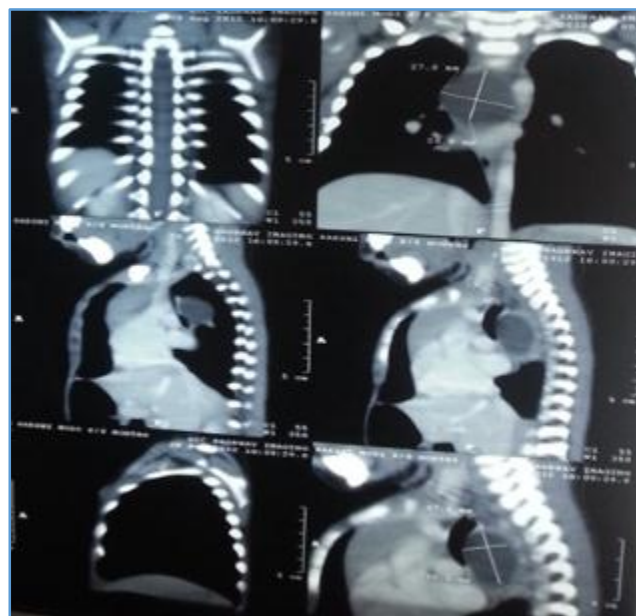


Fig. 1: CT scan showing Bronchogenic cyst



Fig. 2: Barium Swallow (Done to rule out oesophageal duplication cyst)

Time	HR	SpO2	NIBP sys/dia	NIBP mean
21:45	154	100	116/69	(87)
21:46	153	99	112/69	(88)
21:50	151	100	114/75	(91)
21:54	147	95	104/60	(79)
21:55	146	95	99/61	(77)
22:00	145	97	94/55	(71)
22:05	145	44	95/52	(71)
22:10	137	2	72/50	(60)
22:15	147	91	113/78	(90)
22:16	149	92	110/75	(89)
22:20	149	93	108/64	(82)
22:25	147	98	112/66	(83)
22:30	144	98	104/58	(76)

Fig. 3: Trends in the monitor showing changes in intra-operative hemodynamic parameters and oxygen saturation level

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